WASHINGTON
SCIENCE TRENDS

HIGHLIGHTS

FEDERAL BUDGET DIGEST

* R&D Programs
* Atomic Energy
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FEDERAL BUDGET DIGEST

The Federal Government expects to finance well over half the Nation's research and development during the Fiscal Year which begins June 30, 1960, according to an analysis of the new Fiscal 1961 Budget.

Net budget spending for Federal R&D programs is estimated at $8,391 million for the new year -- with $7,875 million for conduct of R&D and $515 million for R&D facilities. This is said to be a $450 million increase over 1960 and a $1,690 million increase over 1959.

The totals do not include spending for routine testing, experimental production, information activities, and training programs, or fellowships for the support of graduate students in the sciences. About 75 cents of every R&D dollar is spent through contracts with private industry and through grants and contracts with universities.

How is this money allocated between Government Agencies and Programs?

Department of Defense continues to account for the largest share; its programs for new and improved weapons, equipment and defense techniques account for about 70 cents of every Federal R&D dollar. Research and Development for the Atomic Energy Commission accounts for about 13 cents.

R&D not connected with "major national security" programs is estimated at $1,461 million in 1961 -- well up from last year's $912 million -- but still at the same relative spending level of 17 cents of every Federal R&D dollar.

National Aeronautics and Space Administration, which accounted for 30 percent of the "peaceful" R&D Budget last year now climbs to a 41 percent share.Another 26 percent goes to the Department of Health, Education and Welfare, chiefly for medical research. Remaining funds go to a wide variety of Government Agencies and programs.

Research vs. Development: A slow but steady increase is apparent in funds for basic research. It is estimated that more than $600 million will be spent for basic studies in Fiscal 1961, up $100 million from last year. The Pentagon and the Space Administration generally account for close to half this total.

A Digest of major new plans, policies and programs follows:

ATOMIC ENERGY COMMISSION

Little change in the total AEC Budget this year. Appropriated 1960, $2,387 million. Estimated 1961, $2,427 million. But a major shift in the way the money will be spent. "Substantial increases" for research and development activities are offset by less buying of uranium ore concentrates.

* Military Reactors -- More money this year for Army, Navy and Air Force reactor development programs -- particularly for missile and satellite projects and nuclear electric powerplants for use at remote Army installations. An additional $10 million will go for the atomic airplane project although the contemplated $73 million total is still well below what Congressional critics have requested. Navy emphasis will be on development of improved and longer-lived reactor fuel and land-based prototype program.

* Civilian Reactors -- A modest $10 million increase in this category to about $188 million for R&D. Another $65 million goes to construction of civilian power plants and related development facilities. Commission will ask for an additional civilian power prototype reactor under the cooperative demonstration program, and for an advanced test reactor. More funds are asked to complete a power reactor to demonstrate nuclear superheat. Mr. Eisenhower states that: "The number, type and size of reactors built and the nature of assistance provided will be determined by the Commission after considering the state of technology and the cooperation proposed by industry.

* Long-Range Research -- Construction expenditures include new multibillion electron volt particle accelerators at Brookhaven, N.Y.; Cambridge, Mass.; Princeton, N.J. and Argonne National Laboratory. Funds are included for a high-flux isotope reactor for production of transuranium elements. The fusion power program will continue and increases are asked in chemical and metallurgical research. About 72 percent of the physical research program is carried out in 13 AEC laboratories, with an additional program in more than 140 colleges, universities and independent laboratories.

* Isotopes and Plowshare -- The budget asks for a modest $500,000 increase for development of new industrial uses for radioisotopes and radiation. New total is $4.5 million. Plowshare program for peaceful uses of nuclear explosives remains at the $8 million level with no new plans announced.

* Weapons -- The budget makes no mention of new atomic testing. Development and production of nuclear weapons and special materials will remain at the "high levels" of previous years.

* Training -- AEC will operate the International Institute of Nuclear Science and Engineering at Argonne and a Puerto Rico Training Center during 1961. Various specialized courses will be offered at reactor and laboratory sites. Reactor technology fellowships will increase slightly -- from 134 to 150. Grants to universities for equipment, classes and related programs continue.

CIVIL DEFENSE

Research and Development funds for civilian defense increase from $4 million to $7,200,000, chiefly for fallout shelter prototypes and site surveys and contract research, emphasizing the social sciences. Appropriation of $6,500,000 is requested for production tests and planning for a civilian protective mask developed for chemical and biological protection. The agency also plans to equip some 36,500 monitoring stations throughout the country with a radiological monitoring set during the year.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

The Space Agency begins to move into the high-cost development stage for new space boosters. Funds for research activities and program direction increase somewhat, but major increase goes for space flight development and operations -- about $660 million in the overall total of $802 million.

* Research -- Emphasis will continue to be primarily on problems of manned and unmanned space vehicles, with only a relatively small effort devoted to problems peculiar to aircraft and missiles. Materials research will center on problems of heating, vibrations and structural integrity of space vehicles, and materials which show promise of being able to withstand the space environment. Propulsion studies will emphasize improvements on chemical systems and possibilities of nuclear and electrical propulsion. Space vehicle control and guidance problems will be underscored as well as problems that arise in re-entry. There will be additional grant and contract support in 1961 for materials research, and on space medical and biological research. For its research programs, NASA wants an aerothermal dynamics facility at Langley, Va., to simulate the environment of vehicles in the hypersonic speed ranges and a laboratory to study the dynamics of objects in various density, temperature, acceleration and vibration environments. A basic materials research laboratory and a laboratory for research on energy conversion and power generation processes and equipment are proposed for the Lewis Research Center at Cleveland.

* Space Flight Development -- Emphasis will be on Project Mercury, with a goal of "actual manned space flights" during the year. Manned space flight takes a considerable $107,750,000 of the total NASA budget. Vehicle Development programs emphasize Saturn clustered booster with some $81 million in funds and more later if necessary. There's money for the Scout launching system but none for the recently cancelled Vega. Remaining vehicle funds are divided between the Delta, with $12,500,000 and Centaur, with $47 million. Work will continue on development of the very high thrust single chambered engine and engines for upper stages of a complete vehicle system. Space Investigations are less ambitious in funding. Money for lunar and planetary exploration actually decreases by $4 million to $45 million. Sounding rocket funding is down slightly to $8 million. Scientific satellite money increases considerably, however, to about $48 million and there's an increase in satellite application money due to development of meteorological and passive communications satellites. Space vehicle systems technology features increased spending for developing systems and components for mid-course and terminal guidance, and attitude control systems for payload packages.

For its space flight development program NASA wants to add a payload test facility and a satellite systems laboratory to its Beltsville, Md., Space Flight Center and a precise trajectory determination and computation center at its Wallops Island, Va., installation. Planned for the Jet Propulsion Laboratory, Pasadena, are a solid propellant facility, a liquid propellant test cell and an antenna range. At Huntsville, Ala., NASA wants to have a Saturn static test facility, a central laboratory, a dynamic test facility, a pressure test cell and other facilities. Electronic and optical equipment, control and data processing equipment and related facilities are planned for tracking installations at various locations. New money is also asked to adapt and modify existing Atlas launching pads for such programs as the Atlas-Agena and Atlas-Centaur launching systems.

DEPARTMENT OF DEFENSE

The Defense Department's shift to nuclear and missile warfare capabilities continues with few major changes during the 1961 budget period. Of the $45-46 million defense budget, some $5,900 million goes to research and development. Aircraft inventories decrease while missile strength grows, more or less in accordance with Congressional directives established last year.

Here is a summary of major programs, with the emphasis on changing systems:

* Missiles -- Nike-Zeus anti-ICBM development and test funding increases but no money is released for the pre-production planning funded by Congress. Bomarc procurement will be largely completed by the time the year is out, and a similar fate awaits the Nike-Hercules. No new funding will be requested for the Thor and Jupiter. Procurement of the Hound Dog and the Quail for use by the B-52 force will continue at a high level.

There may be an increase in Atlas and Titan programs demanded by Congress over Administration objections last year. Work on a possible new configuration for the Titan will be supported. The first funds for production of an operational Minuteman are requested. More money will go to the Polaris as a result of an Administration decision to build additional launching submarines. "Large sums" are included for "the improvement of the range, accuracy and reliability" of the Polaris.

The Pershing will be continued on a high priority basis. Additional funds are included for the tactical close-support rocket Little John and an improved version of Honest John, but a program for an improved "second-generation" Lacrosse missile is dropped. The first production quantity of the Redeye man-carried air defense missile is expected and a "sizable quantity" of Davy Crockett man-carried nuclear rockets will be funded. Hawk procurement is described as "substantial." A "considerable increase" is planned for the Bullpup air-to-surface missile.

In 1961 the first production "buy" of an improved guided antitank missile will be made and work will be supported on development of an air-launched ballistic missile (ALBM) as well as the Mauler for air defense of the forward area of the field army and Missile A., a new, highly-mobile solid-fuel missile for direct support of Army battle groups. Continued delivery is expected of an improved air-to-air Sidewinder and Sparrow missiles as well as the Tartar, Talos and Terrier ship-launched series. Air Force procurement of the Mace system is expected to be completed in 1961 with the establishment of a squadron each in Europe and the Far East. Navy will continue to support work on its Asroc and Subroc anti-submarine systems.

Military space programs involve some $366 million in new funds during the year, chiefly for such satellite systems as early warning (Midas), reconnaissance (Samos), communications (Notus) and navigation (Transit). Department of Defense, through the Advanced Research Projects Agency will continue to support development of improved liquid and solid missile propellants, advanced guidance and communications techniques, research in high-altitude phenomena and space medicine. Basic research funds will be augmented in such areas as atmospheric research, materials, oceanography, seismology and information exchange facilities. Advanced research will also be supported in such fields as electronic components and low temperature physics. Other unexpected large sums for ARPA are classified or otherwise unexplained.

* Electronic Defense Programs: The new Budget no longer carries special breakdowns on electronics and communication systems although these may be available at a later date. On a program basis, however, it is estimated that the cost of operating and maintaining such systems as SAGE, BMEWS and Missile Master will increase by over 70 percent from 1959 to 1961. Funds are provided for procurement of large radars for two Ballistic Missile Early Warning System (BMEWS) stations, and other items on a third, and for additional semiautomatic ground environment (SAGE) computers. Four additional Dewline radar warning sites and 31 "gap filler" radar sites are expected to be activated during the year.

* Army Programs: The new Budget emphasizes fire power and mobility for the Army's tactical forces. There will be 219 new planes - a 35 percent increase in Army Aircraft procurement. The first production quantities of the Chinook helicopter will be purchased, as well as the first Caribou twin-engine transport aircraft. The Army will also be buying Mohawk turboprop observation aircraft and the Iroquois, a utility helicopter used for combat area movements, medical evacuation and light cargo.

For land mobility, the Army will begin its initial procurement of a new family of self-propelled artillery weapons, a new tank recovery vehicle, the new M-60 tank, the improved jeep and some 18,000 tactical trucks. In electronics, emphasis will be on swift, accurate target surveillance equipment and light, rugged and mobile communications. A new surveillance drone will be purchased and there will be large-scale modernization and replacement of other communication and control equipment. For logistics support, the Army will be buying a new amphibious lighter, a new rough terrain fork lift truck, a new mobile assault bridge and similar equipment. A variety of generators is planned for continued procurement to provide combat forces with electrical power to operate missile sites and radar stations as well as for lighting and other uses.

* Navy Programs: Under determined Congressional prodding the Administration is recommending funds for three additional Polaris submarines to be started in the coming year and for advance procurement of long leadtime components on three more, for a total of 15. However, the President stands firm against a nuclear-powered aircraft carrier on the grounds that "use of a conventional powerplant will in no way prevent a carrier from functioning as a completely modern and mobile base for fleet aircraft for its forseeable life." The estimated $130 million savings is certain to be challenged by Congress.

Funds are also requested for construction of three guided missile frigates, two guided missile destroyers, 3 nuclear-powered submarines and eight other ships including a new experimental deep-diving submarine and a new escort research ship. An estimated eight percent increase in Anti-Submarine warfare spending will feature the first operational Dash, a drone ASW helicopter, the HSS-2 all-weather search helicopter and the S2f-3, a new improved carrier-based ASW aircraft. A new air-dropped submarine detection buoy will be procured.

Increased numbers of Navy attack aircraft, including the supersonic A3J will be purchased and there will be more buying of the GV-1 tanker assault transport aircraft. Procurement of the Navy's F8U-2N and F4H all-weather interceptors will be at about present levels. The budget also mentions emphasis on the A2F attack fighter program.

* Air Force Programs: The prime feature of the Air Force budget may well be items that are not included. Mr. Eisenhower declares that the F-108 long-range interceptor program was cancelled because of its "high cost" and the expectation that the manned bomber threat will have diminished by the time the aircraft would have been operational. He uses similar reasoning to justify the cutting of the B-70 bomber program, describing the need for this aircraft as a strategic weapon system as "doubtful." Funds are proposed only on the airframe and engines, with the expectation that by 1963 two prototype aircraft will be available for flight testing.

Air Force will temporarily step up its procurement of the B-52H, an improved version of the B-52 with a turbofan engine. Procurement of the supersonic B-58 medium jet bomber will be continued, although at a lower rate than originally planned, and KC-135 jet tankers will continue to be purchased. A 50 percent increase is planned in procurement of the F-105 all-weather supersonic fighter-bombers. There will be a decrease of five air defense squadrons as additional Bomarc missiles and the F-106 are delivered. It is estimated that by June 30, 1961 the Air Force will have a combat force structure of 91 wings, 5 fewer than at the end of June, 1960. No production interceptor aircraft procurement is planned. However, there are plans for additional tactical transport aircraft and jet training aircraft as well as a new aircraft for modernization of the Military Air Transport Service (MATS) fleet.

A new concept to be applied to the strategic striking force will be the "on the shelf" alert capability. It is believed that this program would permit a portion of the heavy bomber force to be on continuous airborne alert during periods of international tension. Funds for this concept involve indoctrination training, larger inventories of engines and spare parts, and increased maintenance. Mr. Eisenhower expresses the belief that "it is neither necessary nor practical to fly a continuous airborne alert at this time (because) such a procedure would, over a relatively short period of time, seriously degrade our overall capability to respond to an attack."

PRIME CONTRACTORS

Here is a listing of Prime Contractors for space vehicle systems, missiles and aircraft mentioned in budget programs of the National Aeronautics and Space Administration and the Military Services:

Space: Mercury, McDonnell Aircraft; Saturn, NASA; Scout, Chance Vought; Vega, Convair; Delta, Douglas; Centaur, Convair.

Missiles: Nike-Zeus, Western Electric; Bomarc, Boeing; Nike-Hercules, Western Electric; Thor, Douglas; Jupiter, Chrysler; Hound Dog, North American; Quail, McDonnell; Atlas, Convair; Titan, Martin; Minuteman, Boeing; Polaris, Lockheed; Pershing, Martin; Little John, Emerson; Honest John, Douglas; Lacrosse, Martin; Redeye, Convair; Davy Crocket, Army; Hawk, Raytheon; Bullpup, Martin; Mauler, Convair; Missile A, - - ; Sidewinder, Philco/GE; Sparrow, Raytheon; Tartar, Convair; Talos, Bendix; Terrier, Convair; Asroc, Minn. Honeywell; Subroc, Goodyear.

Mil. Space: Midas, Lockheed; Samos, Lockheed; Notus, various contractors; Transit, Lockheed.

Aircraft: Chinook, Vertol; Caribou, De Haviland; Mohawk, Grumman; Iriquois, Bell; Dash, Gyrodyne; HSS-2, Sikorsky; S2F-3, Grumman; A3J, North American; GV-1, Lockheed; F8U-2N, Chance Vought; F4H, McDonnell; A2F, Grumman; F-108, North American; B-70, North American, B-52H, Boeing; B-58, Convair; KC-135, Boeing; F-105, Republic; F-106, Convair.

NATIONAL BUREAU OF STANDARDS

Research spending by the NBS will be increased in 1961 by some $2,350,000. Emphasis will be on measurements and problems in plasma physics, astrophysics, and high-temperature standards and measurements. A comprehensive program is planned of basic and applied research on flames and fires. Work in other fields will be continued, with no major new programs outlined. However, there will be a new program using funds from surplus agricultural commodities, covering some 100 projects in 10 countries over a 3-year period.

New equipment includes $30,000 in 1961 for an atomic frequency standard and $370,000 for a scatter radar transmitter and antenna designed to measure ionic constituents of the upper atmosphere. Also planned are a linear electron accelerator, a 10-million pound universal test machine and two large force measurement equipments.

INTERIOR DEPARTMENT

No major new research and development programs are announced for the Geological Survey, the Bureau of Mines and other technical agencies. Estimates are somewhat lower for the Office of Saline Water conversion, although construction plans continue.

NATIONAL SCIENCE FOUNDATION

Spending here will increase to $190 million, compared with $155 million last year, with most of the additional money going toward support of scientific research projects. Some 2,075 grants will be made, compared with 1,900 last year. There will also be more money for basic research facilities at educational and other non-profit institutions in such fields as astronomy, oceanography, electronic computation and the biological sciences. Support is also being provided for a solar research telescope, atmospheric science facilities and for the preliminary planning for a geophysical institute in Hawaii.

Programs awarding fellowships for advanced study in science and mathematics show no change, but there will be a slight expansion in the number of science and mathematics teachers supported at various institutes. The Foundation's overseas translation program, using funds from the sale of farm surplus, has primarily supported Russian translations by scholars in Israel. The program will now include translations in native and related languages in Poland and Yugoslavia and new programs to be undertaken in Egypt and India. The Foundation also expects to receive some $15 million for grants to universities for modernization of graduate level laboratories, a program initiated recently on a matching-fund basis.

Other training and educational aids come from a variety of Government agencies. The Department of State will award upwards of 3,500 fellowships for study abroad, primarily in the natural and social sciences, and for foreign students in the U.S. Public Health Service offers an estimated 1,841 fellowships for predoctoral and postdoctoral study in the life sciences. The National Science Foundation fellowships for predoctoral and postdoctoral studies come to an estimated 3,673. Department of Health, Education and Welfare will award 2,774 specialized fellowships and traineeships and will also make some $64 million in grants to assist local schools in equipping and renovating laboratories, particularly in the sciences.

FEDERAL COMMUNICATIONS COMMISSION

* UHF Study -- FCC proposes to start a comprehensive study of ultra-high frequency television transmission and reception. Program is intended to develop technical information said to be essential to the resolution of the TV channel allocation problem. The $2,250,000, two-year program will involve the use of improved transmission techniques, the development of optimum performance receivers and extensive field observations and measurements.

TENNESSEE VALLEY AUTHORITY

* Chemical Processes -- A project said to be significant for 1961 involves research on high-temperature techniques for fixation of nitrogen. Work will also continue on utilization of superphosphoric acid and better by-product recovery. Other continuing work relates to new nitrogen compounds, and ammonium polyphosphate.

COAST AND GEODETIC SURVEY

* Expanded Programs -- This Agency and others throughout the Government expects to increase its work in oceanography. A research and development program will be organized in this field as well as hydrography, geomagnetism, geodesy, photogrammetry and seismology. About $350,000 is set aside for design, construction and equipment of a seismological laboratory to check, test and develop seismological equipment and techniques.

MARITIME ADMINISTRATION

* Expanded Programs -- Agency budget for R&D increases slightly, from $6,900 million to $7,100. However, less money will go into facilities in support for the Nuclear Ship Savannah and more for engineering and operations research of advanced ship design concepts, automation and maritime nuclear development studies.

WEATHER BUREAU

* Research Programs -- An $8 million budget covers a variety of Weather Bureau research and development programs. Increased support will go for operation of hurricane research aircraft and inauguration of an intensive investigation of severe local storms; new atmospheric and oceanographic studies and participation in a cooperative program to improve aviation weather services. A large increase will be for operational facilities -- more electronic equipment to measure conditions aloft as well as instruments and computers to provide continuous, automatic measurements of cloud height, visibility, temperature, humidity and winds. The computers will convert data for use in controlling air traffic. Spending for radar repeater scopes at Air Defense Command sites is also planned.

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For coverage of details of these and other programs, watch Washington Science Trends in the weeks and months ahead.